

## REFERENCES

- ALLISON, J.D.; BROWN, D.S.; GRADAC, K.J. 1991. *MINTEQA2/PRODEFA2, a geochemical assessment model for environmental systems: Version 3.0.* Washington, DC: U.S. Government Printing Office. EPA/600/3-91/021.
- ANDERSON, S.R.; LEWIS, B.D. 1989. *Stratigraphy of the Unsaturated Zone at the Radioactive Waste Management Complex, Idaho National Engineering Laboratory, Idaho.* U.S. Geological Survey Water-Resources Investigations Report 89-4065. DOE/ID-22080.
- ASTM. 1993. Standard test method for distribution ratios by the short-term batch method. ASTM Standard D-4319-93. American Society for Testing and Materials.
- BAES, C.F.; MESMER, R.E. 1976. *The Hydrolysis of Cations.* New York: John Wiley & Sons.
- BARRACLOUGH, J.T.; ROBERTSON, J.B.; JANZER, V.J. 1976. *Hydrology of the Solid Waste Burial Ground as Related to the Potential Migration of Radionuclides, Idaho National Engineering Laboratory.* U.S. Geological Survey Open-File Report 76-471. IDO-22056.
- BARTHOLOMAY, R.C. 1998. *Distribution of Selected Radiochemical and Chemical Constituents in Perched Groundwater, Idaho National Engineering Laboratory, Idaho, 1992-1995.* U.S. Geological Survey Water-Resources Investigations Report 98-4026.
- BARNETT, M.O.; JARDINE, P.M.; BROOKS, S.C.; SELIM, H.M. 2000. Adsorption and transport of uranium(VI) in subsurface media. *Soil Sci. Soc. Am. J.* 64:908-917.
- BARTLETT, R.; JAMES, B. 1979. Behavior of chromium in soils: III. Oxidation. *J. Environ. Qual.* 8(1):31-35.
- BIDOGlio, G. 1982. Characterization of Am(III) complexes with bicarbonate and carbonate ions at groundwater concentration levels. *Radiochim. Radioanal. Letters.* 53(1):45-60.
- BIDOGlio, G.; TANET, G.; CHATT, A. 1985. Studies on neptunium(V) carbonate complexes under geologic repository conditions. *Radiochim. Acta.* 38:21-26.

- BROOKINS, D.G. 1988. *Eh-pH Diagrams for Geochemistry*. New York: Springer-Verlag.
- CHISHOLM-BRAUSE, C.; CONRADSON, S.D.; BUSCHER C.T.; ELLER, P.G.; MORRIS, D.E. 1994. Speciation of uranyl sorbed at multiple binding sites on montmorillonite. *Geochim. Cosmochim. Acta*. 58(17):3625-3631.
- CIAVATTA, L.; FERRI, D.; GRIMALDI, M.; PALOMBARI, R.; SALVATORE, F. 1979. Dioxouranium(VI) carbonate complexes in acid solution. *J. Inorg. Nucl. Chem.* 41:1175-1182.
- DAVIS, J.A.; JAMES, R.O.; LECKIE, J.O. 1978. Surface ionization and complexation at the oxide/water interface. I. Computation of electrical double layer properties in simple electrolytes. *J. Colloid Interface Sci.* 63(3):480-499.
- EARY, L.E.; RAI, D. 1987. Kinetics of chromium(III) oxidation to chromium(VI) by reaction with manganese dioxide. *Environ. Sci. Technol.* 21(12):1187-1193.
- FELMY, A.R.; RAI, D.; FULTON, R.W. 1990. The solubility of  $\text{AmOHCO}_3(\text{c})$  and the aqueous thermodynamics of the system  $\text{Na}^+ \cdot \text{Am}^{3+} \cdot \text{HCO}_3^- \cdot \text{CO}_3^{2-} \cdot \text{OH} \cdot \text{H}_2\text{O}$ . *Radiochim. Acta*. 50:193-204.
- FJELD, R.A.; COATES, J.T.; ELZERMAN, A.W. 2000. *Column Tests to Study the Transport of Plutonium and Other Radionuclides in Sedimentary Interbed at INEEL*. Final Report to Idaho National Engineering and Environmental Laboratory. SC:Clemson University.
- GOFF, R.W. 1994. The sorption of select radionuclides on basalt and sedimentary interbed material of the Snake River Plain in southern Idaho. MS Thesis. Clemson, SC:Clemson University.
- GRAHAME, D.C. 1947. The electrical double layer and the theory of electro-capillarity. *Chem. Rev.* 41:441-501.
- GRENTHE, I.; FERRI, D.; SALVATORE, F.; RICCIO, G. 1984. Studies on metal carbonate equilibria: 10. A solubility study of the complex formation in the uranium(VI)-water-carbon dioxide (g) system at 25°C. *J. Chem. Soc. Dalton Trans.* 2439-2443.
- GRENTHE, I.; ROBOUCH, P.; VITORGE, P. 1986. Chemical equilibria in actinide carbonate systems. *J. Less-Common Met.* 122:225-231.
- GRENTHE, I.; LAGERMAN, B. 1991. Studies on metal carbonate equilibria: 22. A coulometric study of the uranium(VI)-carbonate system, the composition of the mixed hydroxide carbonate species. *Acta Chem. Scand.* 45:122-128.

- GRENTHE, I.; FUGER, J.; KONINGS, R.J.M.; LEMIRE, R.J.; MULLER, A.B.; NGUYEN-TRUNG, C.; WANNER, H. 1992. *Chemical Thermodynamics of Uranium.* Chemical Thermodynamics Vol. 1.(Wanner, H.; Forest, I., eds.) Nuclear Energy Agency, OECD. Amsterdam: Elsevier Science Publishers.
- HAYES, K.F.; LECKIE, J.O. 1987. Mechanism of lead ion adsorption at the goethite-water interface. *Geochemical Processes at Mineral Surfaces.* J.A. Davis and K.F. Hayes, eds. ACS Symposium Series 323. Washington, DC: American Chemical Society:114-141.
- HOBART, D.E. 1990. Actinides in the environment. in: *Fifty Years with Transuranium Elements.* Proceedings of the Robert A. Welch Foundation Conference on Chemical Research, XXXIV, Houston, Texas, October 22-23, 1990. 379-434.
- INOUE, Y.; TOCHIYAMA, O. 1985. Studies of the complexes of Np(V) with inorganic ligands by solvent extraction with thenoyltrifluoroacetone and 1,10-phenanthroline: I. Carbonato complexes. *Bull. Chem. Soc. Jpn.* 58(2):588-591.
- ISREALACHVILI, J.N. 1992. *Intermolecular and Surface Forces.* 2<sup>nd</sup> ed. New York: Academic Press.
- ITAGAKI, H.; NAKAYAMA, S.; TANAKA, S.; YAMAWAKI, M. 1992. Effect of ionic strength on the solubility of neptunium(V) hydroxide. *Radiochim. Acta.* 58/59:61-66.
- KHAN, S.A.; RHEMAN, U.R.; KHAN, M.A. 1995. Adsorption of chromium(III), chromium(VI) and silver(I) on bentonite. *Waste Management.* 15(4):271-282.
- KNOBEL, L.L.; MANN, L.J. 1988. *Radionuclides in Groundwater at the Idaho National Engineering Laboratory, Idaho.* U.S. Geological Survey Open-File Report 88-731. DOE/ID-22077.
- KOZAI, N.; OHNUKI, T.; MURAOKA, S. 1993. Sorption characteristics of neptunium by sodium-smectite. *J. Nucl. Sci. Technol.* 30(11):1153-1159.
- LANGMUIR, D. 1997. *Aqueous Environmental Geochemistry.* Upper Saddle River, NJ: Prentice Hall, Inc.
- LANGMUIR, I. 1918. The adsorption of gases on plane surfaces of glass, mica, and platinum. *J. Am. Chem. Soc.* 40:1361-1403.
- LIERSE, C.; TREIBER, W.; KIM, J.I. 1985. Hydrolysis reactions of neptunium(V). *Radiochim. Acta.* 38:27-28.

- LUNDQVIST, R. 1982. Hydrophilic complexes of the actinides: I. Carbonates of trivalent americium and europium. *Acta Chem. Scand.* A36:741-750.
- MANN, L.J.; KNOBEL, L.L. 1988. *Concentrations of Nine Trace Metals in Groundwater at the Idaho National Engineering Laboratory, Idaho*. U.S. Geological Survey Open-File Report 88-332. DOE/ID-22075.
- MAYA, L. 1982. Hydrolysis and carbonate complexation of dioxouranium(VI) in the neutral-pH range at 25°C. *Inorg. Chem.* 21(7):2895-2898.
- MAYA, L. 1983. Hydrolysis and carbonate complexation of dioxoneptunium(V) in 1.0-M NaClO<sub>4</sub> at 25°C. *Inorg. Chem.* 22(14):2093-2095.
- MEINRATH, G.; KIM, J.I. 1991. The carbonate complexation of the Am(III) ion. *Radiochim. Acta.* 52/53:29-34.
- MORRIS, D.E.; CHISHOLM-BRAUSE, C.J.; BARR, M.E.; CONRADSON, S.D.; ELLER, P.G. 1994. Optical spectroscopic studies of the sorption of UO<sub>2</sub><sup>2+</sup> species on a reference smectite. *Geochim. Cosmochim. Acta.* 58(17):3613-3623.
- NAGASAKI, S.; TANAKA, S.; TODORIKI, M.; SUZUKI, A. 1998. Sorption equilibrium and kinetics of NpO<sub>2</sub><sup>+</sup> uptake onto illite. *Radiochim. Acta.* 82:263-267.
- NAGASAKI, S.; TANAKA, S. 2000. Sorption equilibrium and kinetics of NpO<sub>2</sub><sup>+</sup> on dispersed particles of Na-montmorillonite. *Radiochim. Acta.* 88:705-709.
- NECK, V.; KIM, J.I.; KANELLAKOPULOS, B. 1992. Solubility and hydrolysis behavior of neptunium(V). *Radiochim. Acta.* 56:25-30.
- NECK, V.; RUNDE, W.; KIM, J.I.; KANELLAKOPULOS, B. 1994. Solid-liquid equilibrium reactions of neptunium(V) in carbonate solution at different ionic strength. *Radiochim. Acta.* 65:29-37.
- NECK, V.; FANGHÄNEL, TH.; RUDOLPH, G.; KIM, J.I. 1995a. Thermodynamics of neptunium(V) in concentrated salt solutions: Chloride complexation and ion interaction (Pitzer) parameters for the NpO<sub>2</sub><sup>+</sup> ion. *Radiochim. Acta.* 69:39-47.
- NECK, V.; RUNDE, W.; KIM, J.I. 1995b. Solid-liquid equilibria of neptunium(V) in carbonate solutions of different ionic strengths: II. Stability of the solid phases. *J. Alloys Comp.* 225:295-302.
- NECK, V.; FANGHÄNEL, TH.; KIM, J.I. 1997. Mixed hydroxo-carbonate complexes of neptunium(V). *Radiochim. Acta.* 77:167-175.
- NITSCHE, H.; STANDIFER, E.M.; SILVA, R.J. 1989. Americium(III) carbonate complexation in aqueous perchlorate solution. *Radiochim. Acta.* 46:185-189.

- . 1990. Neptunium(V) complexation with carbonate. *Lanth. Act. Res.* 3:203-211.
- PATIL, S.K.; RAMAKRISHNA, V.V. 1976. Sulphate and fluoride complexing of U(VI), Np(VI) and Pu(VI). *J. Inorg. Nucl. Chem.* 38:1075-1078.
- RAI, D.; SASS, B.M.; MOORE, D.M. 1987. Chromium(III) hydrolysis constants and solubility of chromium(III) hydroxide. *Inorg. Chem.* 26(3):345-349.
- RAWSON, S.A.; WALTON, J.C.; BACA, R.G. 1991. Migration of actinides from a transuranic waste disposal site in the vadose zone. *Radiochim. Acta.* 52/53:477-486.
- RUNDE, W.; MEINRATH, G.; KIM, J.I. 1992. A study of solid-liquid phase equilibria of trivalent lanthanide and actinide ions in carbonate systems. *Radiochim. Acta.* 58/59:93-100.
- RUNDE, W.; NEU, M.P.; CLARK, D.L. 1996. Neptunium(V) hydrolysis and carbonate complexation: Experimental and predicted neptunyl solubility in concentrated NaCl using the Pitzer approach. *Geochim. Cosmochim. Acta.* 60(12):2065-2073.
- SASS, B.M.; RAI, D. 1987. Solubility of amorphous chromium(III)-iron(III) hydroxide solid solutions. *Inorg. Chem.* 26(14):2228-2232.
- SCANLAN, J.P. 1977. Equilibria in uranyl carbonate systems: II. The overall stability constant of  $\text{UO}_2(\text{CO}_3)_2^{2-}$  and the third formation constant of  $\text{UO}_2(\text{CO}_3)_3^{4-}$ . *J. Inorg. Nucl. Chem.* 39:635-639.
- SCHMALZ, B.L. 1972. *Radionuclide Distribution in Soil Mantle of the Lithosphere as a Consequence of Waste Disposal at the National Reactor Testing Station*. U.S. Atomic Energy Commission. IDO-10049.
- SCHROEDER, D.C.; LEE, G.F. 1975. Potential transformations of chromium in natural waters. *Water, Air, Soil Pollut.* 4:355-365.
- SILVA, R.J.; NITSCHE, H. 1984. Thermodynamic properties of chemical species of waste radionuclides. in: *NRC Nuclear Waste Geochemistry '83*, eds. Alexander, D.H.; Birchard, G.F., Reston, Virginia, August 30-31, 1983. NUREG/CP-0052, U.S. Nuclear Regulatory Commission, Washington, D.C. 70-93.
- SILVA, R.J.; BIDOGlio, G.; RAND, M.H.; ROBOUCH, P.B.; WANNER, H.; PUIGDOMENECH, I. 1995. *Chemical Thermodynamics of Americium*. Chemical Thermodynamics Vol. 2. Nuclear Energy Agency, OECD. Amsterdam: Elsevier Science Publishers.
- SPOSITO, G. 1980. Derivation of the Freundlich equation for ion exchange reactions in soils. *Soil Sci. Soc. Am. J.* 44:652-654.

- . 1984. *The Surface Chemistry of Soils*. New York: Oxford University Press.
- STUMM, W.; MORGAN, J.J. 1996. *Aquatic Chemistry: Chemical Equilibria and Rates in Natural Waters*. 3rd ed. New York: John Wiley & Sons.
- TRAVIS, C.C. AND EITNER, E.L. A survey of sorption relationships for reactive solutes in soil. *J. Environ. Qual.* 10(1):8-17.
- USGS. 1999. *Review of the Transport of Selected Radionuclides in the Interim Risk Assessment for the Radioactive Waste Management Complex, Waste Area Group 7 Operable Unit 7-13/14, Idaho National Engineering and Environmental Laboratory, Idaho*. U.S. Geological Survey Administrative Report. Idaho Falls, Idaho.
- VITORGE, P. 1992. Am(OH)<sub>3</sub>(s), AmOHCO<sub>3</sub>(s), Am<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub>(s) stabilities in environmental conditions. *Radiochim. Acta*. 58/59:105-107.
- WEBER, W.J.; McGINLEY, P.M.; KATZ, L.E. 1991. Sorption phenomena in subsurface systems: Concepts, models and effects on contaminant fate and transport. *Wat. Res.* 25(5):499-528.
- WOOD, W.W.; Low, W.H. 1986. Aqueous geochemistry and diagenesis in the Eastern Snake River Plain aquifer system, Idaho. *Geol. Soc. Am. Bull.* 97:1456-1466.